

CLAIMS:

1. A method of inspecting a wafer, comprising the steps of:

irradiating and scanning a focused charged particle beam onto a surface of a wafer on which patterns are formed through a semiconductor device fabrication process;

obtaining a secondary charged particle image of a desired area of said wafer by detecting secondary charged particles emitted from said surface of said wafer through the irradiating and scanning step;

obtaining information about image feature amount of each pattern within said desired area from said obtained secondary charged particle beam image;

comparing information about image feature amount obtained in the step of obtaining information with a preset value;

estimating, on the basis of a result from the step of comparing, a quality of patterns which have been formed around said desired area; and

outputting an information of a result of said estimating.

2. A method of inspecting a wafer according to the claim 1, wherein an information of said image feature amount

is obtained for each type of the pattern in the step of obtaining information.

3. A method of inspecting a wafer according to the claim 1, wherein said information about said image feature amount is obtained by calculating image feature amount of said pattern type and computing the statistic of said calculated image feature amount.

4. A method of inspecting a wafer according to the claim 3, wherein said image feature amount of said pattern type to be calculated is a mean value or a maximum value of signal amount in the pattern section.

5. A method of inspecting a wafer according to the claim 1, wherein said image feature amount of said pattern type to be calculated is a dimension of the pattern section.

6. A method of inspecting a wafer according to the claim 1, wherein said preset value is a threshold level that has been preset in association with a pattern type.

7. A method of inspecting a wafer according to the claim 1, comprising a step of predetermining a threshold level for evaluating the quality of image feature amount from said image feature amount and the result of product inspection after the completion of the fabrication process.

8. A method of inspecting a wafer according to the claim 1, comprising a step of predetermining a threshold level for evaluating the quality of image feature amount

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from said image feature amount and the measurement value of contact resistance between a pattern section and an underlying conductor.

9. A method of inspecting a wafer according to the claim 1, comprising a step of feeding said output of said estimated result back to said semiconductor device fabricating line.

10. A method of inspecting a wafer, comprising the steps of:

irradiating a focused charged particle beam onto a desired area of said wafer with a plurality of chips of the same pattern on it;

obtaining a charged particle beam image of said desired area;

inspecting said desired area from said charged particle beam image;

performing estimation of failure occurrence conditions of said chip from the inspection data of said desired area for said plurality of chips on said wafer;

determining a distribution of said estimated failure occurrence conditions on said chip; and

outputting information about said determined distribution of said estimated failure occurrence conditions over said wafer.

FIG. 10

11. A method of inspecting a wafer according to the claim 10, further comprising a step of performing said estimation of failure occurrence conditions on said chip for almost all chips on said wafer.

12. A method of inspecting a wafer according to the claim 10, further comprising the step of displaying a chip that has been estimated to have a failure on the wafer map as distinguished from other chips.

13. A method of inspecting a wafer according to the claim 10, further comprising the step of inspecting said desired area through said charged particle beam image with the help of brightness information of said charged particle beam image of said desired area.

14. An apparatus for inspecting a wafer, comprising:  
a charged particle beams scanning irradiation means for performing scanning irradiation of a focused charged particle beam onto said surface of a wafer with patterns formed on it;

a secondary charged particle beam detection means for detecting secondary charged particles emitted from said surface of said wafer by scanning irradiation of a focused charged particle beam onto said surface of said wafer with the help of said charged particle beams scanning irradiation means;

an image obtaining means for obtaining a charged particle beam image of said wafer from detected signals of secondary charged particles that have been detected with the help of said secondary charged particle beam detection means;

an information obtaining means for obtaining information about image feature amount on said surface of said wafer from the charged particle beam image of said wafer that has been obtained with the help of said image obtaining means;

a storage means for storing a threshold level;

an estimation means for estimating the quality of a pattern that has been formed on the periphery of said desired area by comparing information about image feature amount that has been obtained with the help of said information obtaining means; and

an outputting means for outputting information about the quality of said pattern that has been estimated with the help of said estimation means.

15. An apparatus for inspecting a wafer according to the claim 14, wherein said information obtaining means obtains information about said image feature amount by calculating image feature amount of said pattern and computing the statistic of said calculated image feature amount.

16. An apparatus for inspecting a wafer according to the claim 15, wherein said image feature amount is a mean value or a maximum value of the signal amount of a charged particle beam image of the pattern section.

17. An apparatus for inspecting a wafer according to the claim 14, wherein said wafer has a plurality of types of patterns on it and said threshold level is stored in association with said types of patterns.

18. An apparatus for inspecting a wafer according to the claim 14, further comprising:

a inspection result inputting means for inputting the results of product inspection after the completion of the fabrication process, and

a threshold level calculating means for determining a threshold level from image feature amount that has been calculated with the help of said image signature amount calculating means and the result information of a product inspection after the completion of the fabricating process that has been input to said inspection result inputting means,

wherein the threshold level that has been determined with the help of said threshold level calculating means is stored into said storage means.